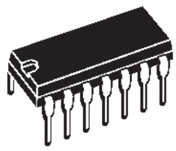
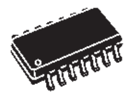
TS27M4C,I,M

LOW POWER CMOS QUAD OPERATIONAL AMPLIFIERS

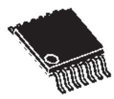
- VERY LOW CONSUMPTIION : **150μA/op**
- OUTPUT VOLTAGE CAN SWING TO GROUND
- EXCELLENT PHASE MARGIN ON CAPACITIVE LOADS
- STABLE AND LOW OFFSET VOLTAGE
- THREE INPUT OFFSET VOLTAGE SELECTIONS



N
DIP14
(Plastic Package)



D
SO14
(Plastic Micropackage)



P
TSSOP14
(Thin Shrink Small Outline Package)

ORDER CODES

Part Number	Temperature Range	Package		
		N	D	P
TS27M4C/AC/BC	$0^oC, +70^oC$	•	•	•
TS27M4I/AI/BI	$-40^oC, +125^oC$	•	•	•
TS27M4M/AM/BM	$-55^oC, +125^oC$	•	•	•
Example : TS27M4ACN				

DESCRIPTION

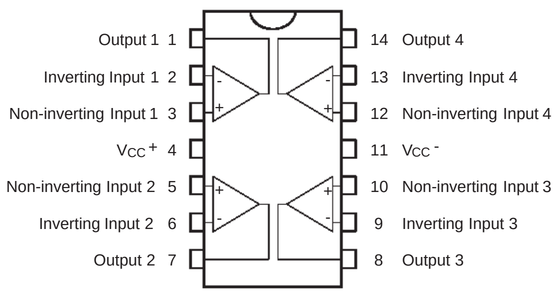
The TS274 series are low cost, low power quad operational amplifiers designed to operate with single or dual supplies. These operational amplifiers use the SGS-THOMSON silicon gate CMOS process allowing an excellent consumption-speed ratio. These series are ideally suited for low consumption applications.

Three power consumptions are available allowing to have always the best consumption-speed ratio :

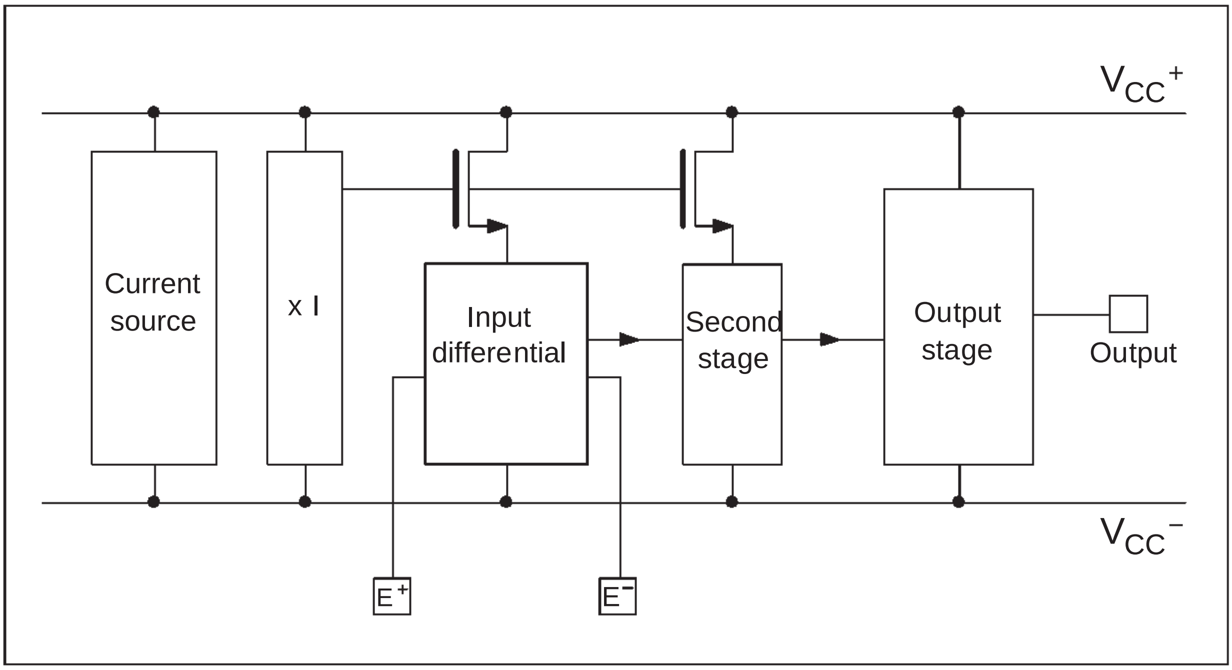
- I_{CC}= 10μA/amp. : TS27L4 (very low power)
- I_{CC}= 150μA/amp. : TS27M4 (low power)
- I_{CC}= 1mA/amp. : TS274 (high speed)

These CMOS amplifiers offer very high input impedance and extremely low input currents. The major advantage versus JFET devices is the very low input currents drift with temperature (see figure 2).

PIN CONNECTIONS (top view)



BLOCK DIAGRAM



MAXIMUM RATINGS

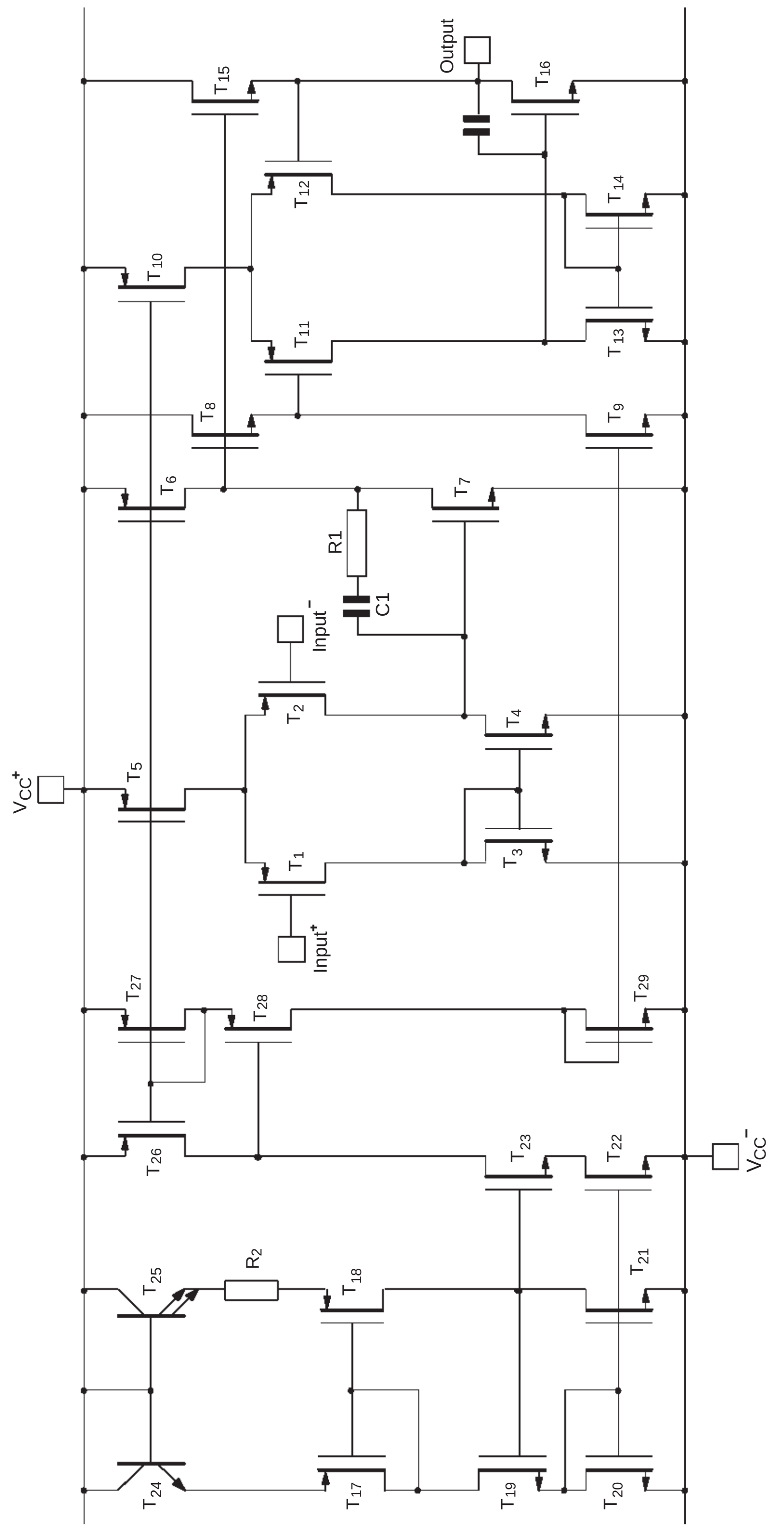
Symbol	Parameter	Value	Unit
V_{CC}^{+}	Supply Voltage - (note 1)	18	V
V_{id}	Differential Input Voltage - (note 2)	±18	V
V_i	Input Voltage - (note 3)	-0.3 to 18	V
I_O	Output Current for $V_{CC}^{+} \geq 15V$	±30	mA
I_{in}	Input Current	±5	mA
T_{oper}	Operating Free-Air Temperature Range TS27M4C/AC/BC TS27M4I/AI/BI TS27M4M/AM/BM	 0 to +70 -40 to +125 -55 to +125	°C
T_{stg}	Storage Temperature Range	-65 to +150	°C

Notes :
1. All voltage values, except differential voltage, are with respect to network ground terminal.
2. Differential voltages are at the non-inverting input terminal with respect to the inverting input terminal.
3. The magnitude of the input and the output voltages must never exceed the magnitude of the positive supply voltage.

OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{CC}^{+}	Supply Voltage	3 to 16	V
V_{icm}	Common Mode Input Voltage Range	0 to V_{CC}^{+} - 1.5	V

SCHEMATIC DIAGRAM (for 1/4 TS27M4)



ELECTRICAL CHARACTERISTICS

$V_{CC}^{+} = +10V$, $V_{CC}^{-} = 0V$, $T_{amb} = 25^{o}C$ (unless otherwise specified)

Symbol	Parameter	TS27M4C/AC/BC			TS27M4I/AI/BI TS27M4M/AM/BM			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{io}	Input Offset Voltage $V_O = 1.4V$, $V_{ic} = 0V$ TS27M4C/I/M TS27M4AC/AI/AM TS27M4BC/BI/BM $T_{min.} \leq T_{amb} \leq T_{max.}$ TS27M4C/I/M TS27M4AC/AI/AM TS27M4BC/BI/BM		 1.1 0.9 0.25	 10 5 2 12 6.5 3		 1.1 0.9 0.25	 10 5 2 12 6.5 3.5	mV
DV_{io}	Input Offset Voltage Drift		2			2		µV/°C
I_{io}	Input Offset Current - (note 1) $V_{ic} = 5V$, $V_o = 5V$ $T_{min.} \leq T_{amb} \leq T_{max.}$		 1	 100		 1	 200	pA
I_{ib}	Input Bias Current - (note 1) $V_{ic} = 5V$, $V_o = 5V$ $T_{min.} \leq T_{amb} \leq T_{max.}$		 1	 150		 1	 300	pA
V_{OH}	High Level Output Voltage $V_{id} = 100mV$, $R_L = 100k\Omega$ $T_{min.} \leq T_{amb} \leq T_{max.}$	 8.7 8.6	 8.9		 8.7 8.5	 8.9		V
V_{OL}	Low Level Output Voltage $V_{id} = -100mV$			 50			 50	mV
A_{vd}	Large Signal Voltage Gain $V_o = 1V$ to $6V$, $R_L = 100k\Omega$, $V_{ic} = 5V$ $T_{min.} \leq T_{amb} \leq T_{max.}$	 30 20	 50		 30 10	 50		V/mV
GBP	Gain Bandwidth Product $A_v = 40dB$, $R_L = 100k\Omega$, $C_L = 100pF$ $f_{in} = 100kHz$		 1			 1		MHz
CMR	Common Mode Rejection Ratio $V_o = 1.4V$, $V_{ic} = 1V$ to $7.4V$	 65	 80		 65	 80		dB
SVR	Supply Voltage Rejection Ratio $V_{CC}^{+} = 5V$ to $10V$,$V_o = 1.4V$	 60	 80		 60	 80		dB
I_{CC}	Supply Current (per amplifier) $A_v = 1$, no load, $V_o = 5V$ $T_{min.} \leq T_{amb} \leq T_{max.}$		 150	 200 250		 150	 200 300	µA
I_o	Output Short Circuit Current $V_{id} = 100mV$, $V_o = 0V$		 60			 60		mA
I_{sink}	Output Sink Current $V_{id} = -100mV$, $V_o = V_{CC}$		 45			 45		mA
SR	Slew-Rate at Unity Gain $R_L = 100k\Omega$, $C_L = 100pF$, $V_i = 3$ to $7V$		 0.6			 0.6		V/µs
∅m	Phase Margin at Unity Gain $A_v = 40dB$, $R_L = 100k\Omega$, $C_L = 100pF$		 45			 45		Degrees
K_{ov}	Overshoot Factor		30			30		%
e_n	Equivalent Input Noise Voltage $f = 1kHz$, $R_S = 100\Omega$		 38			 38		$\frac{nV}{\sqrt{Hz}}$
V_{O1}/V_{O2}	Channel Separation		120			120		dB

Note : 1. Maximum values including unavoidable inaccuracies of the industrial test.

TYPICAL CHARACTERISTICS

Figure 1 : Supply Current (each amplifier) versus Supply Voltage

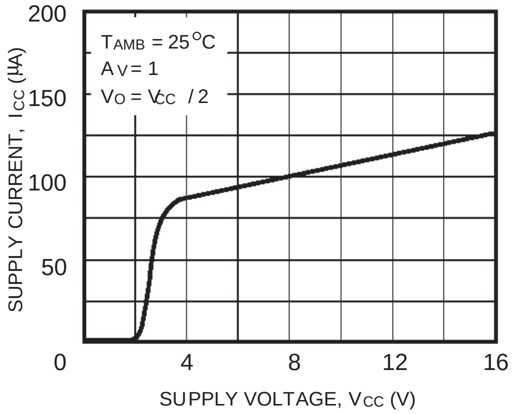


Figure 2 : Input Bias Current versus Free Air Temperature

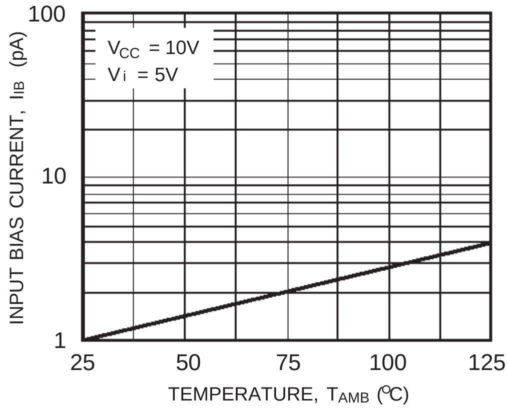


Figure 3a : High Level Output Voltage versus High Level Output Current

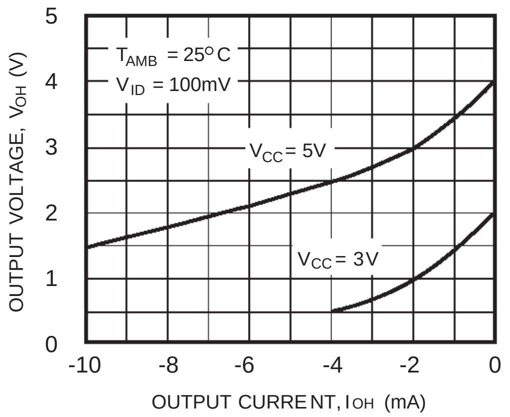


Figure 3b : High Level Output Voltage versus High Level Output Current

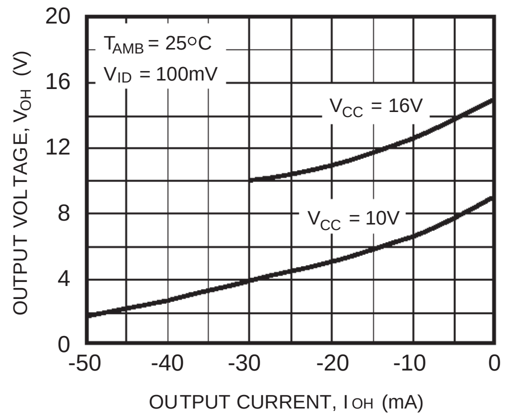


Figure 4a : Low Level Output Voltage versus Low Level Output Current

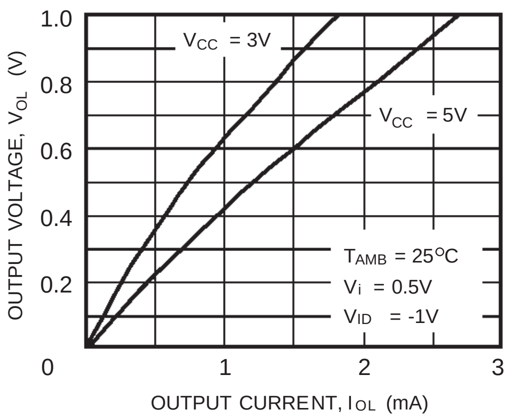
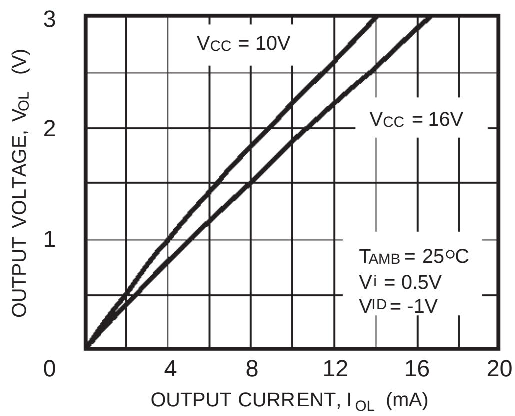


Figure 4b : Low Level Output Voltage versus Low Level Output Current



TYPICAL CHARACTERISTICS (continued)

Figure 5 : Open Loop Frequency Response and Phase Shift

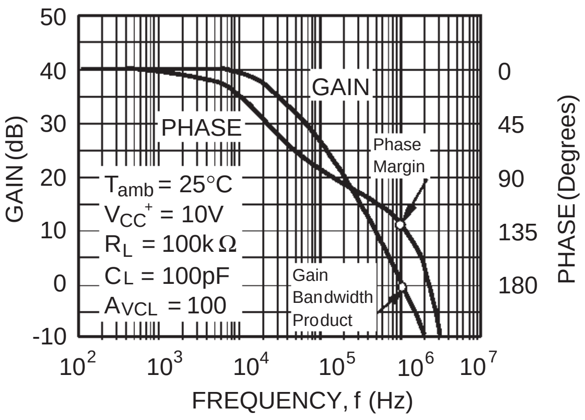


Figure 6 : Gain Bandwidth Product versus Supply Voltage

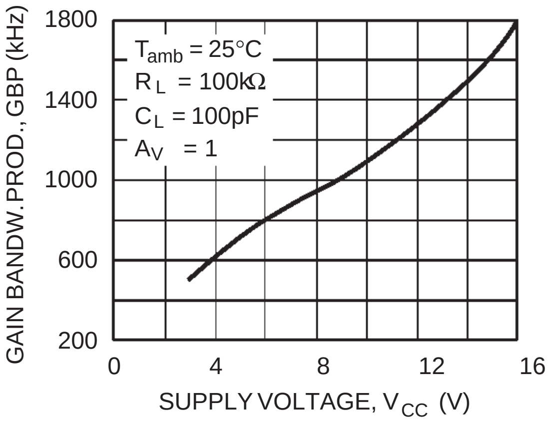


Figure 7 : Phase Margin versus Supply Voltage

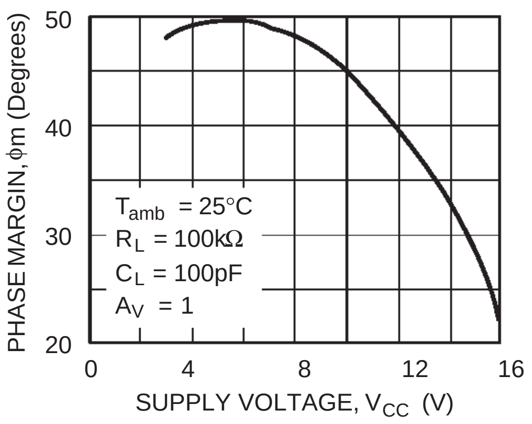


Figure 8 : Phase Margin versus Capacitive Load

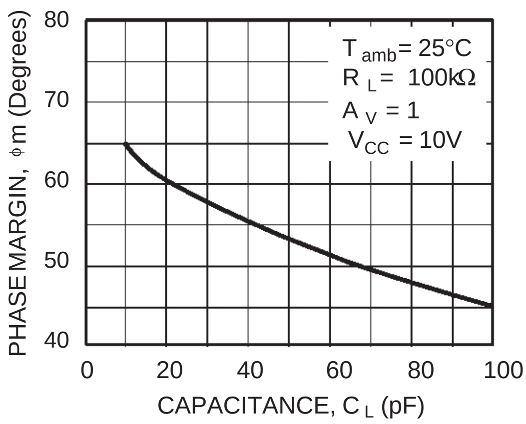


Figure 9 : Slew Rates versus Supply Voltage

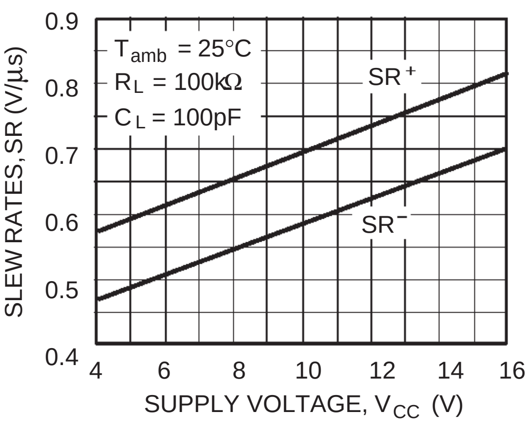
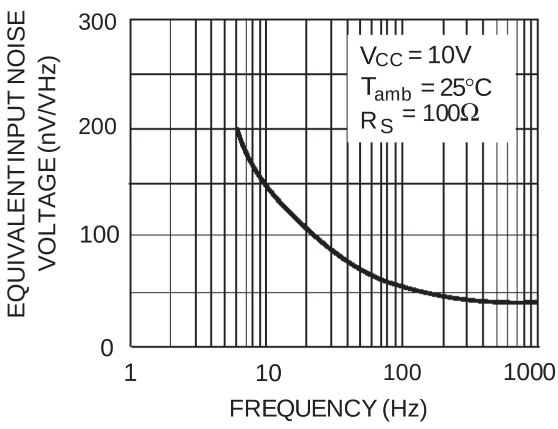
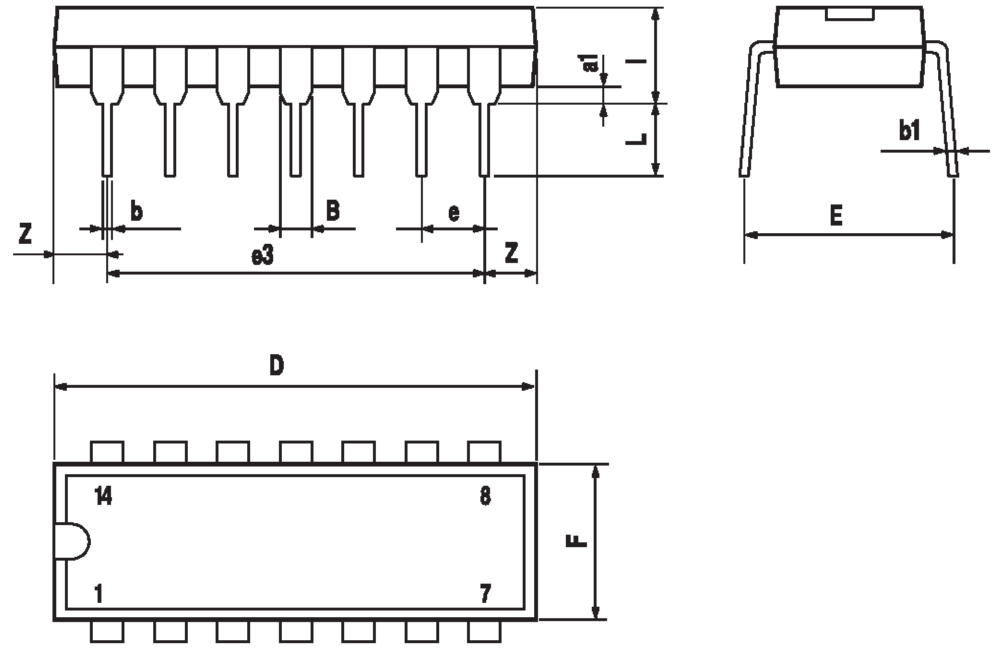


Figure 10 : Input Voltage Noise versus Frequency



PACKAGE MECHANICAL DATA
14 PINS - PLASTIC DIP



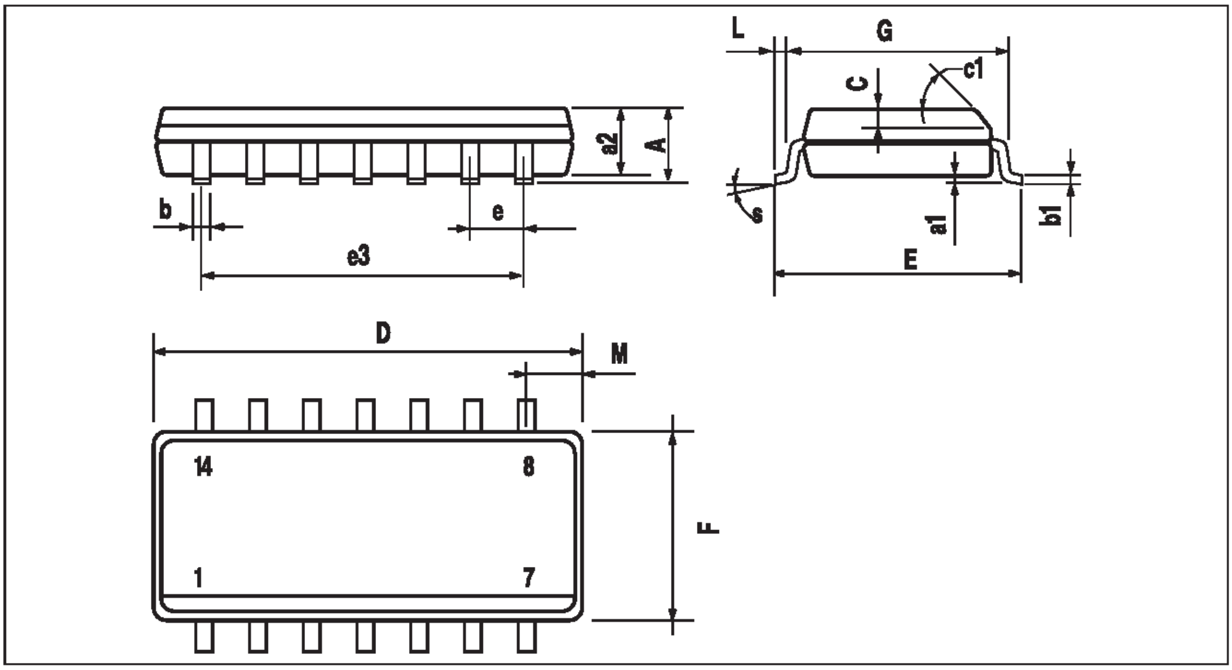
PM-DIP14.EPS

Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
a1	0.51			0.020		
B	1.39		1.65	0.055		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		15.24			0.600	
F			7.1			0.280
i			5.1			0.201
L		3.3			0.130	
Z	1.27		2.54	0.050		0.100

DIP14.TBL

PACKAGE MECHANICAL DATA

14 PINS - PLASTIC MICROPACKAGE (SO)



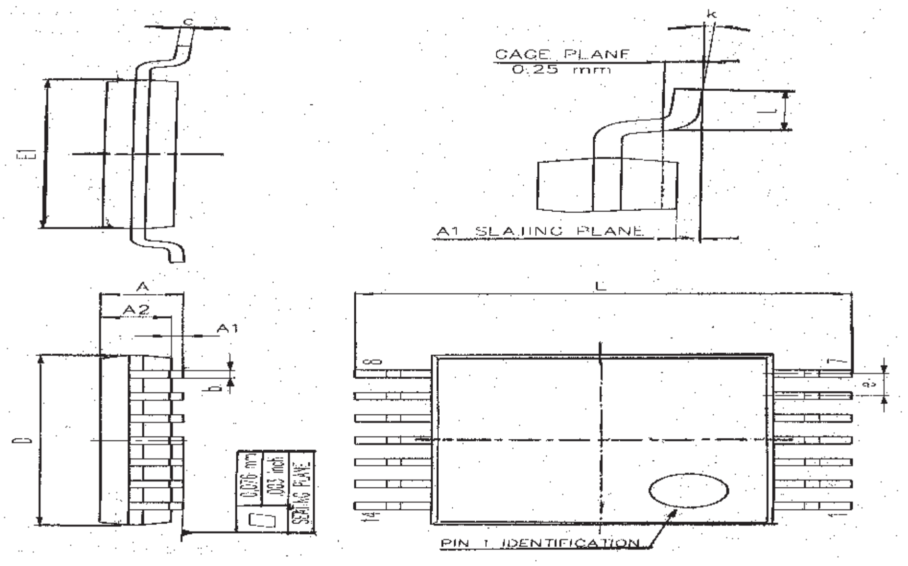
PM-SO14.EPS

Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.069
a1	0.1		0.2	0.004		0.008
a2			1.6			0.063
b	0.35		0.46	0.014		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.020	
c1	45° (typ.)					
D	8.55		8.75	0.336		0.334
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		7.62			0.300	
F	3.8		4.0	0.150		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.020		0.050
M			0.68			0.027
S	8° (max.)					

SO14.TBL

PACKAGE MECHANICAL DATA

14 PINS - THIN SHRINK SMALL OUTLINE PACKAGE



Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.20			0.05
A1	0.05		0.15	0.01		0.006
A2	0.80	1.00	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.15
c	0.09		0.20	0.003		0.012
D	4.90	5.00	5.10	0.192	0.196	0.20
E		6.40			0.252	
E1	4.30	4.40	4.50	0.169	0.173	0.177
e		0.65			0.025	
k	0°		8°	0°		8°
l	0.50	0.60	0.75	0.09	0.0236	0.030